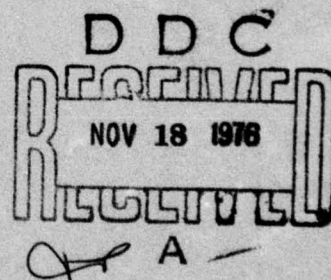


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RM-5446-1-ISA/ARPA
OCTOBER 1967

AN EVALUATION OF CHEMICAL
CROP DESTRUCTION IN VIETNAM

Russell Betts and Frank Denton



PREPARED FOR:
THE OFFICE OF THE ASSISTANT SECRETARY
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FOREWORD

This report is one of a series of Rand studies that examine the organization, operations, motivation, and morale of the Viet Cong and North Vietnamese forces that fought in South Vietnam.

Between August 1964 and December 1968 The Rand Corporation conducted approximately 2400 interviews with Vietnamese who were familiar with the activities of the Viet Cong and North Vietnamese army. Reports of those interviews, totaling some 62,000 pages, were reviewed and released to the public in June 1972. They can be obtained from the National Technical Information Service of the Department of Commerce.

The release of the interviews has made possible the declassification and release of some of the classified Rand reports derived from them. To remain consistent with the policy followed in reviewing the interviews, information that could lead to the identification of individual interviewees was deleted, along with a few specific references to sources that remain classified. In most cases, it was necessary to drop or to change only a word or two, and in some cases, a footnote. The meaning of a sentence or the intent of the author was not altered.

The reports contain information and interpretations relating to issues that are still being debated. It should be pointed out that there was substantive disagreement among the Rand researchers involved in Vietnam research at the time, and contrary points of view with totally different implications for U.S. operations can be found in the reports. This internal debate mirrored the debate that was then current throughout the nation.

A complete list of the Rand reports that have been released to the public is contained in the bibliography that follows.

(CRC, BJ: May 1975)

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For a description of the Viet Cong Motivation and Morale Project and interviewing process, the reader should first consult W. Phillips Davison, *User's Guide to the Rand Interviews in Vietnam*, R-1024-ARPA, March 1972.

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PREFACE

Since July 1964, The RAND Corporation has been conducting a study of Viet Cong and North Vietnamese Army motivation and morale based mainly on RAND-conducted interrogations of prisoners and defectors, and to a lesser degree on captured documents and on interviews with prisoners and defectors conducted by U.S. or GVN intelligence agencies. This effort is sponsored jointly by the Office of the Assistant Secretary of Defense for International Security Affairs and the Advanced Research Projects Agency.

This Memorandum, prepared for the Advanced Research Projects Agency, is one of several reports already published or now in publication dealing with individual aspects of the overall study. Addressed to a relatively narrow and specialized segment of the total U.S. involvement in Vietnam, it restricts itself to appraising the impact of the destruction of agricultural crops through aerial chemical operations in the Republic of Vietnam in terms of:

- (1) the benefits to the US/GVN, as indicated by the adverse effect on the enemy's ability to obtain food, and
- (2) the costs to the US/GVN expressed in terms of possible alienation of the rural population.

No attempt has been made to explore the many other complex considerations which would have to be taken into account in any future decisions on herbicide spraying policy in South Vietnam. This report is a companion piece to RM-5450-ISA, A Statistical Analysis of the U.S. Crop Spraying Program in South Vietnam, by A. J. Russo. Taken together, these two Memoranda are intended to provide background material relevant to decisions regarding future crop spraying operations in Vietnam.

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SUMMARY AND CONCLUSIONS

→ This Memorandum reports on an attempt to evaluate the utility of chemical crop destruction operations* in Vietnam. The evaluation is limited to two aspects of the question of overall utility:

- (1) The effectiveness of chemical crop destruction as a means of denying food to the VC.
- (2) The cost of the operations in terms of increasing the hostility of the non-VC, rural population toward the US/GVN.

Depriving the VC of their food is not the only possible effect of crop spraying. Destroying their local supplies may cause them to change their normal procedures for acquiring food. And though they continue to obtain it in adequate amounts, they may do so only at additional costs and strains to their system. But, because the direct denial of food seems to be a primary reason for the crop spraying program, this analysis is limited to that one aspect of effectiveness.

Costs other than peasant alienation might also have been considered. However moderate the monetary costs of conducting the operations, the costs of feeding persons whose crops have been destroyed are not insignificant, and the contribution of crop destruction to the general inflation of food prices may be important enough to constitute a study in itself. In the long run, however, one important issue in the US/GVN pacification, nation-building efforts is the attitude of the Vietnamese peasant. A nonhostile populace would seem desirable if the GVN ever hopes to make progress in its pacification objectives, and destroying a farmer's source of sustenance is not a way to make friends. This analysis therefore restricts itself to examining the extent of, and the reasons for, whatever hostility has been engendered by the crop destruction operations.

*The operations in question involve the use of chemical sprays spread by airplane to destroy food crops in South Vietnam. Although the program is directed at the VC, the fact that the VC obtain most of their food from the neutral rural population dictates the destruction of civilian crops.

Certain limitations must be placed on the findings regarding these two questions. The findings are based on an analysis of data from 206 interviews with ex-VC and non-VC civilians. The data are often rather limited, since not all subjects respond on every topic, and in some cases relationships cannot be said to be statistically significant. In some specific instances, the data are of such a character that inferences must be made from indirect rather than direct evidence. Despite this, the patterns appear to be well enough defined to provide, on an intuitive basis, a high degree of confidence in the conclusions presented.

The effectiveness of the crop destruction program in denying food to the VC was examined from three perspectives.

First, a very simple deductive conclusion was developed based on official estimates of the number of VC in Vietnam. The VC constitute only about 1.5 percent of the population in South Vietnam. At the macro level, it would thus appear that, allowing for losses in the system, they need no more than about 3 percent of all the food consumed in the country. Because of the wide access the VC have to resources throughout most areas of Vietnam, it would appear on this basis alone that it would be difficult to destroy enough food, except in localized instances, to prevent the VC from eating.*

Second, our sources were questioned about their food rations while in the VC. These responses were examined for time trends in rations and for indications of shortages, especially in heavily sprayed areas. The data generally indicate barely adequate to fully adequate diets for VC from virtually all units sampled, with no consistent indication of deterioration with time. Indications were given that a few fringe units (independent companies and platoons in Central Vietnam and some village or hamlet guerrilla units) may have suffered severe food

*Given the somewhat unrealistic assumption that all other parameters remained constant, even if overall consumption were reduced 50 percent the VC would need only about 6 percent of the remaining resources to maintain a constant food supply. These calculations do not directly consider the post-harvest food destruction operations which are conducted against VC storage areas by GVN/Allied forces in the country. However, a 50 percent overall loss factor is included.

deprivation. On the whole, however, the data indicate that the main combat units even in Central Vietnam appear to be adequately fed by VC standards.

Third, an attempt was made to correlate rice rations in different parts of the country with the amount of spray in that area. Although the intensity of crop destruction varied widely from area to area, and although some areas were hit very hard,* the average VC rice ration did not appear to vary significantly from that expected, given the agricultural productivity in the area. That is, the Main Force VC ate relatively well in rice-surplus areas and less well in rice-short regions. The local intensity of spray operations did not account for any additional variation.

The data consistently suggest that the crop destruction program has not in any major sense denied food to the VC. Moreover, it appears that it will be exceedingly difficult to accomplish this goal with such a program. The VC have coercive access to rice at the consumer level. Although the VC have suffered dislocations as food has become more scarce, they generally appear to have been able to transfer most of the deprivation burden to the local peasant.

The VC produce a relatively small percentage of the food they consume. Much of the agricultural produce destroyed by the crop destruction operations belongs to the civilian farmers in VC-controlled or contested areas. The RAND subjects were asked about the reaction of the local population to the program.

Although it is very rare to hear these subjects** consistently express views which might be construed as unfavorable to the GVN, they almost unanimously indicate that the peasant is very hostile to the program. The indications are that very negative feelings toward the US/GVN are aroused as a consequence of the spray, and a number of subjects speak of increased support for the VC resulting from such

*Ten to twenty percent of cultivated land sprayed in a few areas. RM-5450 provides a more complete discussion of the geographic distribution of spray operations.

**Over half of these subjects were defectors from the VC, and virtually all of them were dependent on the GVN for their continued security and livelihood.

operations. The alienation appears to result from several causes:

First, crop spraying strikes at the very heart of the peasant's existence. It destroys his food supply and his handiwork. Like agricultural people in other parts of the world, the Vietnamese has a deep emotional attachment to his crops as a symbol of his future security and of his labors.

Second, a significant percentage of our subject indicate a widespread fear of these chemicals as being poisonous to humans. Some of this fear is based on hearsay; some, on firsthand experience.

Third, the rural population does not always regard the crop spraying operations as a necessary or even useful way of attacking the VC, and, in many instances, comes to believe that they are directed as much against the peasants living in Viet Cong areas as against the Viet Cong themselves. Often, too, they seem to feel that the GVN is willing to sacrifice them if, in the process, it can get at the Viet Cong.

The feeling that the US/GVN is at best minimally concerned with the peasant's welfare tends to exacerbate the feelings engendered by the act of spraying itself. There is an almost total absence of indications in our data of efforts by the US/GVN to educate people about herbicide spraying, to warn them of attack, or to assist those who have been affected. These peasant perceptions appear to contribute to a temper of mind which is receptive to Viet Cong propaganda designed to strengthen the latter's control over the affected population and to discredit the GVN and the United States.* Although the available data do not readily allow predictions, these trends would seem to be inimical, to an indeterminant degree, to any long-range US/GVN pacification objectives.

*Most of the incidents discussed by our respondents were in VC-controlled or contested area; although some would consider the persons living in such areas as enemy civilians, it is a fact that they are South Vietnamese citizens and therefore the targets of our long-range pacification efforts.

CONCLUSIONS

Within the context of what has been studied, it would appear the crop destruction effort may well be counterproductive. The VC continue to feed themselves while the peasant bears the brunt of the deprivation, and he doesn't like it. .

If it is deemed advisable to continue the program under these conditions, the expected alienation might conceivably be ameliorated. "Conceivably," because the following suggestions, although not new, have not been implemented in the past.

Some actions which might lessen the alienation:

- (1) Educate the peasant about the effects of the spray on humans. In particular: "Don't eat or drink sprayed food or water. If exposed, (especially children), wash the spray off as quickly as possible." If, as suspected, further analysis indicates that present spray concentrations occasionally may approach lethal levels for the most vulnerable persons (infants and elderly), perhaps reducing concentrations would lessen the chances of persons receiving lethal doses without significantly reducing the spray's effectiveness in destroying crops.
- (2) Provide assistance to those whose crops are destroyed. At present, many peasants are very reluctant to take refuge (among other reasons) because of the alleged lack of assistance provided in the past. Improved assistance and communications might, perhaps, change this image.
- (3) Perhaps most important of all is to have the GVN attempt to communicate to the peasants, in VC as well as in GVN areas, its concern for their welfare as Vietnamese citizens. It would be valuable to communicate to the farmers in a believable manner that this program is undertaken reluctantly for the welfare of the country and that the GVN sympathizes with innocent sufferers. As indicated above, communication probably will not be particularly effective without greatly improved material assistance to lessen the deprivation.

CONTENTS

FOREWORD.....	iii
PREFACE.....	vii
SUMMARY AND CONCLUSIONS.....	ix
Section	
I. INTRODUCTION.....	1
II. DATA CHARACTERISTICS AND LIMITATIONS.....	3
III. EFFECTS ON THE VIET CONG.....	7
Deductive Analysis of the Probable Effects.....	7
Subjective Statements about Food Availability.....	9
Correlation of Rations with Spray Intensity.....	11
Recapitulation.....	12
IV. CIVILIAN ATTITUDES.....	13
Peasant Alienation Resulting from Crop Spraying.....	13
Crop Destruction Causes Material Losses to	
Civilians.....	14
The Toxicity of Chemical Agents.....	16
Lack of Understanding.....	17
Aid and/or Succor.....	17
Public Education and Propaganda.....	19
What Can Be Done?.....	21
REFERENCES.....	23

I. INTRODUCTION

Crop destruction by chemical sprays was reportedly first undertaken in 1962 when CHMAAG Vietnam received approval to conduct a test operation against VC sanctuary areas in Phuoc Long province. Since that time operations have been continuing on an increasing scale.* The objective of the program, to deny food to the Viet Cong, is accomplished by spraying plant-killing chemicals from specially fitted C-123 transport aircraft. The potential for destroying vegetation over large areas is considerable since under ideal circumstances one aircraft sortie can destroy close to 100 percent of the vegetation, including food crops, over an area of about 300 acres.

Since the program's inception, the nature and intensity of the war have changed considerably. The VC have grown from a relatively small, nearly self-supporting group to a large organization having coercive control over (or at least access to) major portions of rural South Vietnam. Moreover, more civilians are now affected than were in 1963. Concurrently, the VC food acquisition capabilities are also radically different today. These and other related changes lead to the question: Has the answer on the utility of chemical crop destruction as a method of resource denial changed? Additionally, the intensification of crop spraying operations, combined with the increased civilian involvement in the war, lead one to ask: In what ways have spraying operations affected the civilian population?

This analysis was undertaken at the request of The Advanced Research Projects Agency (ARPA) of OSD. The stated objectives of the

*Chemical sprays have also been used since late 1961 to defoliate forested areas in order to reduce the cover available to the VC. These defoliation operations are considered here only to the extent that the chemicals have spilled over onto civilian or VC crops. In 1962 and 1963, a total of 936 acres of agricultural land was sprayed by crop destruction operations. These figures rose in 1964, 1965, and 1966 to 14,050, 67,430 and 113,335 acres respectively. During the first four months of 1967, 37,600 acres of crops were sprayed. Defoliation operations have been expanded to a far greater extent. In 1964 and 1965 respectively, 63,500 and 160,300 acres were sprayed by defoliation sorties. This increased to 751,100 acres in 1966, and to 547,400 acres in the first four months of 1967.

analysis were as follows:

- (1) Determine the effects of crop destruction on the VC.
- (2) Determine the effects of crop destruction on the attitudes of the rural population.
- (3) Determine the effects of crop destruction on the life of the rural population.
- (4) Determine, as possible, methods to reduce the impact of negative attitudes.

The specific focus of this analysis is the relationship between the potential tactical advantages of denying food to the Viet Cong and the potential political disadvantages among the civilian population of herbicide crop destruction.

II. DATA CHARACTERISTICS AND LIMITATIONS

This analysis is based to a large extent on data taken from 206 RAND interviews with former Viet Cong and non-VC civilians. Other supplementary sources of data are the MACV file of documents captured from the VC and interviews with captured and rallied VC conducted by various agencies (US and GVN) in Vietnam. External data, such as the rate of herbicide operations by province and agricultural productivity, were used for validity and reliability purposes.

The subjects providing information for this analysis had experience in the VC largely between 1965 and early 1967. They range in rank (one indicator of knowledgeability) from the lowest-level hamlet guerrilla through one Main Force battalion commander. They include a significant number of platoon and company level officers who were fairly knowledgeable about the VC regular force food rations. Similarly, a number of VC civilian cadre and village and hamlet guerrillas provide some expertise about conditions and attitudes in the civilian areas.

It is difficult to determine the characteristics for the sample because only a fraction of the total number of interviewees provides relevant information on any given topic. This arises from the nature of the interviews, which followed a relatively unstructured, open-ended form of questioning. Many subjects were either not asked about some of the topics or did not provide relevant information. One must also add, of course, that the subjects varied in knowledgeability and willingness to talk.

Within these limitations the following tables define the characteristics of the sample of respondents. These data represent the total sample of persons providing some relevant data for the analysis.

TABLE 1

DATE OF LATEST SERVICE IN VC

<u>Date of Latest Service in VC</u>	<u>Percent of Subjects</u>
Prior to July 1965	18.5
July-December 1965	22
January-June 1966	34.5
July-December 1966	13
January or later 1967	7
No VC service	5

TABLE 2

VC FORCE AND RANK

Percent of VC in Each Category

	<u>Civilian</u>	<u>Guerrilla</u>	<u>VC Regular Forces</u>	<u>NVA</u>
Rank & File	6.1	7.6	15.8	5.3
Cadre	17.4	4.2	34.2	9.5
Total	23.5	11.8	50.0	14.8

TABLE 3

DISTRIBUTION OF RANK FOR VC REGULAR FORCES

<u>Rank</u>	<u>Percent of Subjects</u>
Private	31.5
Squad Leader and Assistant	22.6
Platoon Leader and Assistant	28.7
Company Level Officers	14.8
Battalion Level Officers	2.5

The use of former VC as sources of information obviously raises the question of their reliability. More than half of them were defectors from the VC and, of course, all of them, at the time of the interviews, were in the hands and dependent on the largess of the GVN. Previous research with these and similar data collected by the RAND staff suggests that the bias in these interviews is generally in a pro-GVN, rather than a pro-VC, direction. Thus, there is reason to consider

expressions of anti-VC sentiments cautiously, just as there is reason to take expressions of affection for the GVN with a "grain of salt." On most issues, openly pro-VC or anti-GVN statements occur with considerably less frequency or predictability than do their opposites.* While there can be no proof of the validity of the patterns found in the statements of these subjects, there is small likelihood of pro-VC biases determining or dominating any set of response patterns. The results from this analysis generally tend to cast an unfavorable light on GVN programs. If the expected pro-GVN bias does exist, then factoring out that bias would only strengthen the findings. Thus, the probable bias in this case makes little difference.

The subjects interviewed come mostly from the lower-level VC hierarchy, where their limited responsibility narrowed their perspective and hence the scope of their information. Organizational adaptations occurring at middle levels in the hierarchy simply would have gone unobserved by most of these subjects, at least insofar as any adaptation was moderately successful. Even if the VC had** to pay a high price in reallocating manpower to overcome supply difficulties resulting from herbicide operations, it is highly unlikely that the problem would have come to the attention of most of the subjects providing the information for this report -- so long as they continued to eat.

Within the above limitations, the raw interview transcripts themselves provide a valid source of information about herbicide spraying. Given the validity of the transcripts, there is the problem of defining the patterns of responses about spraying.

The frequency with which given answers occurred was assumed to be the major definition of the pattern of responses. In order to guard against analyst bias, the transcripts of the original open-ended questions and responses were coded into multiple response categories.***

*This is not universally true since there are a number of hard-core VC in the sample.

**It is not known whether they have or have not.

***Although several coders were employed for this, intercoder reliability was maintained at about the 95 percent level.

The frequency with which these coded categories of responses occurred provided the basic description of the data patterns.*

As an additional check on subject attitude or information bias, the response frequencies were examined separately for different types of persons. It was known from previous research that the distributions of responses from prisoners were frequently different from those of defectors. Or, as discussed earlier, it was expected that persons of different rank in the VC might have different perspectives. Thus, wherever the data were sufficiently numerous, response frequencies were examined separately for such groups.

In summary, the patterns described accurately reflect the data. Probably subject biases tend to go against indicated patterns -- that is, if the biases were corrected for, the most likely consequence would be the reinforcement of the patterns. The patterns described in this analysis are known to be valid only for the population of the data base, and the extent to which these conclusions are transferable to the total population cannot be stated definitively. However, the selection procedures for interview subjects were largely random, and were based primarily on the criteria of availability and knowledgeability. Intuitively, one feels that the views obtained are likely to represent closely those of the total population.

It is realized that the data are limited and that other aspects of the problem exist. In a rapidly changing situation such as the one in Vietnam, no analysis can ever be completely up-to-date. This Memorandum is based primarily on materials which were collected during 1966, although additional, more recent materials which were available in Saigon as late as June 1967 are also used wherever possible.

*For example, "X percent of the subjects said that their food ration had improved in the three months before they left the VC."

III. EFFECTS ON THE VIET CONG

Although RAND does not have access to any document describing the present official goals of the crop destruction program, one logical and often-expressed purpose is to deny food to the Viet Cong. "Deny" is used to mean both actual deprivation and the process of making food more difficult and expensive to obtain.

The VC must eat. If food becomes scarcer in any area, they can have recourse to one or a combination of at least the following:

- (1) Reduce their average rations.
- (2) Reduce their force size.
- (3) Import food from food-rich areas.
- (4) Increase their tax rate on the local civilian populace.
- (5) Increase their ability to produce their own food.
- (6) Live on accumulated reserves in the short run.

Since official order of battle data indicate that the VC forces have increased rather than decreased, and since they do not seem to have starved, what effects, if any, have the crop destruction operations had on the VC food supplies?

DEDUCTIVE ANALYSIS OF THE PROBABLE EFFECTS

Throughout most of rural Vietnam, the VC have a centralized, coercive ability to extract from the peasants money, rice, labor, and other support. Even in areas of relatively great GVN strength, the VC obtain resources by transportation taxes, sales taxes, and physical threats. Thus, the Viet Cong organization has access to a large percentage of the agricultural resources of the country.

From Table 4 it is seen that the VC represent less than 2 percent of the population of South Vietnam. The interviews indicate that they normally eat less well than the typical peasant. Thus, it seems safe to say that they consume no more than 1.5 to 2 percent of all food consumed. Assuming a requirement of 3 percent to allow for wastage, losses, etc., the VC still need only a relatively small proportion of the total food consumed. Thus, even a 50 percent destruction of the total rice crop

by herbicides would mean that the VC would require only on the order of 6 percent of the then-remaining production. It seems very reasonable to suppose that they would have the ability to exact such a percentage, by force or otherwise.

Moreover, even this argument makes the VC situation appear somewhat worse than perhaps in fact it would be. Morally and pragmatically, it is undesirable to have 50 percent of the population face starvation. In addition to being destroyed by herbicide operations, rice is also lost by ground operations and bombing attacks. However, the United States has been shipping rice to Vietnam in quantities from four to ten times the amount destroyed by crop spraying, and the data indicate that the imports from the United States are keeping the food consumption close to its "normal" level.* So long as the VC retain control over a significant portion of the population and remain well integrated in the rural economy, they can tax on consumption as well as on production.

TABLE 4

Corps	VC RICE REQUIREMENTS		
	Civilian Population	VC Population ^a	VC as % of Population
I	2,420,500	56,750	2.3
II	2,770,500	68,447	2.5
III	5,393,400 ^b	60,821	1.1
IV	6,141,700	80,925	1.3
TOTAL	16,726,100	266,943	1.6

^aJune 1966 CICV order of battle.

^bIncluding about 2.3 million in Saigon.

*In 1966 the GVN imported about 670,000 metric tons of rice, most of it from the United States. Based on the area covered by crop destruction, about 67,000 tons were destroyed. However, spillover onto crops occurs from the defoliation operations and the crop destruction operations are not 100 percent effective. If a 10 to 20 percent spillover occurs from defoliation (a 6 to 1 defoliation to crop destruction ratio existed in 1966), and if crop destruction is somewhat below 100 percent effective, one can estimate from 50,000 to 100,000 tons destroyed. An absolute maximum of 150,000 tons seems reasonable.

It is virtually a truism to say that the VC would like to get their food as easily as possible. Similarly, it is stating the obvious to say that some of the easiest ways for the VC to obtain food are simply to buy, tax, or confiscate rice from the immediate rural area, or to grow it themselves. It is a considerable step, however, to conclude from this that destruction of this local crop is going to deny food to the VC or even make it significantly more difficult for them to obtain food. The VC tax surface shipments of rice and the sale of rice; families put aside a handful of rice at each meal; intermediaries buy rice for the VC at local GVN controlled markets, and so on. If the VC can reach a significant portion of the consuming population (as they can), and if these latter are not on a starvation diet, the VC can obtain their necessary requirements by consumption taxation and requisition. Although empirical verification is unavailable, it would appear from this deductive analysis that the VC could partially live off of the rice imported from the United States by taxing during transportation, on consumption, etc.

Deductively, it thus appears that crop destruction is of limited effectiveness in denying food to the VC. The unarmed, unorganized local peasant is likely to bear the main deprivation as the VC continue to take the bite they need.

SUBJECTIVE STATEMENTS ABOUT FOOD AVAILABILITY

The a priori expectation is that the VC have not suffered any major food shortages because of crop destruction conducted to date. An obvious means of checking this expectation against reality is to ask former VC if they have experienced increasing food shortages.

Most of the VC's available for questioning are lower-level personnel and, thus, system adaptation problems will not generally be known to them. That is, so long as they continue to get their daily food, system strains will go unnoticed. However, it seems reasonable to say that if pressures approach system capacity,* dislocations in food supply will occur.

*And obviously if capacity is exceeded.

The history of the daily ration was examined for subjects from the VC regular forces (NVA and VC Main and Local Forces). The data were examined for time trends, absolute ration, geographic variations, complaints about food, temporary shortages, etc. It must be remarked that the available data are not extensive, and a high statistical confidence cannot therefore be placed on the following statements about the patterns which were found.

- (1) The normal food ration is adequate (to support life) for almost all units sampled. However, in Central Vietnam the ration is small enough to be a source of irritation for the average soldier. In the delta, food is, in the VC terms, plentiful.
- (2) The only indications of inability to meet the authorized rations for regular force units were:
 - (a) interruptions of one or two days resulting from US/GVN ground operations.
 - (b) in the central highlands some fringe units (autonomous platoons and companies) had serious food problems. More than likely these shortages were the result of crop destruction operations.
- (3) No indication of a consistent deterioration in ration existed through the latter half of 1966. The data are meager (only about 15 subjects from the latter half of 1966), but, for every subject indicating a decrease in ration, another said that food had gotten better.*
- (4) The few higher ranking or better informed** subjects generally expressed a belief that more intense crop destruction could cause problems, but that the system could adapt to the "present level."

Thus the data generally support the a priori expectation that the VC still have adequate food resources.

*These findings are based on an analysis of interviews with 61 ex-VC regular force members.

**Two battalion-level officers and a few persons in the logistics system.

CORRELATION OF RATIONS WITH SPRAY INTENSITY

Even though the data do not indicate that the VC have been unable to feed their troops, has the crop destruction program reduced the ration? The question cannot be answered directly, but data are present which permit inferences to be made.

The different areas of South Vietnam have been very unequally sprayed. The above question can be restated in this form: Is there a correlation between the intensity of spray operations in an area and the average ration for the VC forces in that area? In order to obtain an answer to this question, the data on daily ration taken from the RAND interviews were used to estimate the average regular force ration for sixteen areas of Vietnam.* RM-5450, a companion piece to this report, presents a detailed description of this analysis. A sketch of the method and a summary of the results are given here.

Generally, the VC live off the local population. Thus, to a great extent, they eat better when the local people do also. They also import rice from foreign sanctuaries. Since these two factors -- local rice availability and access to foreign sanctuary -- influence VC ration, it was deemed necessary to take them into account when attempting to correlate the VC ration with the intensity of local crop destruction.

Multiple linear regression was used in an effort to determine if crop destruction had influenced the ration and, if so, to what extent.** The findings indicate that the ration in each of the areas is that which would be expected from a knowledge of rice production, population, and access to a foreign sanctuary. The intensity of crop destruction operations was not significantly correlated with the size of the ration. Essentially all (94 percent) of the variance in ration could be statistically predicted from the three stated variables.

*Each area was selected to be as homogeneous as possible with regard to rice productivity under the constraint of having at least seven subjects from the area. The estimated ration was the average of the ration for all subjects from an area.

**Regressing average ration on productivity, sanctuary, and crop destruction variables over the sixteen areas.

The regression equation gave an empirical method for predicting ration from production. Since crop destruction can be thought of simply as a decrease in production, it is possible to use this empirical equation to predict the effect on rations which varying the level* of crop destruction will have by considering the latter as a change in production. The empirical model indicates that an X percent reduction in production will result in less than an X percent decrease in the ration. That is, a 10 percent decrease in production usually results in somewhat less than a 10 percent decrease in ration. Starving the people will starve the VC. But many people will starve before any VC do.

RECAPITULATION

The a priori expectation was that resource destruction would not be an effective means of denying food to the VC unless major portions of all resources were destroyed and the VC were denied access to rice consumers. The available empirical evidence supports the conclusion that, through 1966, crop destruction operations had not prevented the VC from feeding themselves.

This, of course, is a macro-level analysis. A micro analysis would indicate system adaptation problems as new rice sources had to be found. Again, analysis at the micro level would, without doubt, indicate localized food shortage difficulties and considerable concern from the organization as normal food sources dried up.** It does seem reasonable to say, however, that unless a very extensive portion of the crop is destroyed, the VC can feed themselves so long as they can gain access to the consuming population.

*As is always true, such equations can at best only be considered to be valid within a limited range of values. Major changes in production might (probably would) change the empirical relationships.

**Such cases can be amply illustrated in sprayed areas from a perusal of documents captured from the VC.

IV. CIVILIAN ATTITUDES

Aside from growing their own food or importing it, the VC's source of supply is the indigenous population. Given the intimate economic relationship between the Viet Cong and the agricultural sector, it is not surprising that a major portion of the crops destroyed through aerial spraying has inevitably been civilian-owned and cultivated. Civilian crops are often destroyed (or partially so) incidentally to an operation against VC crops or cover, but they have also been destroyed purposely with the intent, implied if not stated, of cutting off Viet Cong food sources.*

PEASANT ALIENATION RESULTING FROM CROP SPRAYING

The reaction to spraying operations which destroy civilian crops is almost unanimously hostile. Eighty-eight percent of our interview sources indicate that the people blame the US/GVN for the destruction and 74 percent assert that the blame approaches a level of hatred in its intensity.

As a further index of the intensity of the reaction, it is interesting to compare these indications of blame to similar statements about attitudes toward US/GVN bombing and shelling of villages. Despite frequent loss of life and property, the GVN is blamed more often for the herbicide operations than for the more conventional military

*It might be argued that people living in VC areas are de facto supporters of the Viet Cong and are therefore legitimate targets of attacks intended to hurt the Viet Cong. However, the best available data suggest that most of the VC-controlled population remains neutral and that the active VC supporters constitute only a small minority. In the words of a Montagnard company political officer who had rallied:

Not everybody living in VC-controlled areas is a VC. There are also people who have children working for the GVN among these people. The GVN should protect them instead of treating them as enemies. Thus, the GVN is multiplying its enemies instead of reducing them. By spraying the people's crops, the GVN is pushing the people to the VC side.

Moreover, even persons in VC areas are citizens of South Vietnam and are long-range targets for our pacification efforts.

operations -- 88 percent versus 71 percent. Moreover, the VC share to a much greater extent the opprobrium for the military attacks -- 61 percent of the subjects indicate that the people blame the VC for bombings versus only 30 percent for spray attacks.

TABLE 5

COMPARISON OF VILLAGE ATTITUDES
TOWARD SPRAYING AND BOMBING

	<u>Percent Yes</u>	
	<u>Spray</u>	<u>Bombing</u>
Blame US/GVN	88	71
Blame VC	30	61
Some increased support or join VC	50 ^a	29

^aThis relationship is based on only 16 respondents, and the extent of increased support is unspecified.

Why does chemical crop destruction stir up so much hostility? First, crop destruction strikes at the very heart of the peasant's existence -- both his food supply and his handiwork. Second, the civilian population generally lacks knowledge and understanding about both the nature and the purpose of these operations. And finally, the hostility is due to what the peasant conceives to be a lack of GVN concern for his welfare, combined with an active and generally effective Viet Cong effort to exacerbate his already intense feelings.

CROP DESTRUCTION CAUSES MATERIAL LOSSES TO CIVILIANS

Chemical crop destruction strikes at a central value of peasant life -- rice. In an agricultural society such as Vietnam's, where the overwhelming majority of the rural population is engaged in self-subsistence farming, the production of food is of supreme economic and social (even quasi-religious) significance. Destruction of crops not only threatens to confront peasants with food shortages and economic hardship, it also threatens to disrupt their total pattern of existence. The following statement from a Regroupee platoon leader who had rallied

is illustrative of the people's attitude:

The people were very afraid...; it was as if (the spraying aircraft) were some kind of wicked spirits who threatened to bring disaster upon the people.

Local food shortages are the usual consequences of a spraying operation. Over 60 percent of our subjects indicated inadequate food supplies for at least some families after a spray attack, and about 10 percent indicated cases of actual starvation.*

Several factors do tend to mitigate the extent to which severe food shortages result as a direct consequence of crop destruction. In the lowlands the villagers with money often can buy food in the unaffected areas or in the local towns, and in some cases the poor can work as farm laborers. Frequently the extent of the damage is limited, particularly in those instances where crops are destroyed as a peripheral consequence of defoliation operations. Villagers often stockpile extra foodstuffs against such contingencies, and in extreme cases the Viet Cong have brought in food or have helped form mutual aid associations for those hardest hit.**

The shortages and dislocations in food supply are an obvious source of alienation. On occasion, however, the Viet Cong also receive some increment of ill will as they attempt to maintain a relatively unimpaired flow of produce and taxes. This increment, however, seems insignificant in comparison with the ill will aimed at the US/GVN. Only 31 percent of the subjects indicated that the villagers placed any blame at all on the VC. Moreover, the feeling was much less intense than that directed against the US/GVN. The ability of the VC to influence the peasants' thinking with regard to crop spraying appears to largely account for this.

*Largely in Montagnard areas.

**Suffering would be far more widespread if two or more successive crops were hit.

THE TOXICITY OF CHEMICAL AGENTS

Our data indicate that there is considerable resentment and fear generated by the widespread belief that the spray is detrimental to health and even at times fatal. Viet Cong propaganda, according to captured documents, has at times played heavily and successfully on the poison gas theme. There is considerable evidence, however, that some of the beliefs regarding the toxicity of the chemical agents are based on actual experiences.

Seventy to 80 percent of the subjects indicated that people who were significantly exposed to these chemicals could expect, at least, runny noses, nausea, cramps, and diarrhea for several days. Approximately 10 percent believed that the chemicals could cause fatalities, especially among infants. A preliminary investigation using available data on the toxicity of these chemicals showed that, under certain conditions, doses approaching lethal levels might conceivably be received by exposed infants.* Whether or not these levels are actually

*RAND does not have access to results from any toxicity tests conducted with the spray deposition rates and dilutions used in Vietnam, and it is not known if such tests have been conducted.

Because the stories of our sources seemed both plausible and sincere, an effort was made to check on the toxicity of these chemicals. One ingredient, 2,4-D, is rated as very toxic, and a 50 percent lethal dose is given as 50 to 500 milligrams per kilogram of body weight (See Ref. 1). Tests with the prototype spray equipment indicate that with an average spray deposition rate of three gallons per acre (understood to be the normal maximum in Vietnam), depositions on the ground in excess of 10 gallons per acre occur in a few test cells (See Ref. 2). In Vietnam, formation spraying is not uncommon so it is conceivable that in overlap areas as much as twice this amount of spray might be deposited.

Under these conditions, a 1 ft.² area might receive several times the lethal dose for a 6 kilogram child if the chemical were used in an undiluted form. There is no readily available information on the specific concentrations used, nor on the toxicity of the chemical mixture of which 2,4-D is only a part. Obviously, this analysis is too simplified to permit drawing definitive conclusions; however, the data would indicate the possibility that the spraying is occurring under conditions where, at the minimum, harmful physiological effects are possible and where, at the maximum, the lower edges of toxic levels conceivably could be approached.

reached is relatively less important for purposes of this analysis than what people believe to be true. That is, in many instances, our sources' attitudes toward chemical crop spraying were conditioned by their belief in the toxicity of these chemicals irrespective of its actual effects.

LACK OF UNDERSTANDING

The rural peasants' lack of understanding about the purpose of crop destruction has probably contributed substantially to their hostility toward these operations. Central to this is the peasants' view that the burden of spraying operations falls on them more than on the Viet Cong. They usually cannot see that the loss of crops has had any more than a secondary (and even then only limited) effect on the Viet Cong, and they cannot comprehend why the US/GVN would want to do such a thing to them. The following statement by a Main Force rallier quoting inhabitants of a village near the Ho Bo woods in Binh Dong Province (III Corps, near Zone D) is representative of peasant thought as it emerges from our sample:

They said ... that even under the French nothing so awful had ever occurred. They complained that they weren't VC, so why had the Government destroyed their land and crops.

AID AND/OR SUCCOR

Among our sources, the feeling that the US/GVN was inadvisably and incorrectly attacking the civilian population was further exacerbated by the fact that in most instances they felt there was a major lack of US/GVN concern for the welfare of the people who had lost their crops. Concurrently, there is some limited evidence in the interviews that some segments of the populace might be more willing to accept crop spraying as a legitimate (though still highly undesirable) weapon of war, provided the US/GVN could at the same time successfully demonstrate its sincere concern for their welfare. This, of course, implies a program of active aid, not just a simple expression of concern.

In our interviews, the incidence of GVN aid to people affected by crop spraying was very low. Surprisingly enough, aid from the Viet Cong

was more commonly attested to.* Among those cases citing aid from the GVN, two occurred when the GVN had mistakenly destroyed crops in GVN areas. Additionally, nearly half of the few GVN aid cases consisted of aid to the rich only. In contrast to this, the VC aid most frequently took the form of arranging for redistribution of rice from those with a surplus to those in need.

Several of our sources discussed villagers' efforts to obtain assistance from the GVN, and in two cases aid was felt to be the result of village petitions. In another three cases where petitions had been presented, aid had been promised but, despite the lapse of several months, had not been received. One regrettable fact of these petitions is the "official" response cited by three other subjects. In each instance, the villagers were told that because the Americans had conducted the spray missions, the GVN had no responsibility and could do nothing.

In most instances, direct assistance or compensation from the US/GVN might be impractical or undesirable because spraying is targeted for Viet Cong-controlled areas. Government concern for the people's welfare could be shown by providing facilities and supplies adequate to handle equitably any refugee flows resulting from crop destruction. Somewhat surprisingly, however, our sources suggest that herbicide operations do not appear to have caused as significant refugee movements as may have been anticipated. Whenever and wherever possible, our informants suggest, people have preferred to remain on their land, to get by however possible, and to hope for a successful crop with the next harvest. A prevalent feeling was that the civilian who had lost his crops probably would not be appreciably better off as a refugee in GVN areas than he would be remaining where he was -- and might not be as well off.** The feeling among these sources (a very limited sample)

*Some 30 percent of these interviewees indicated some form of aid from the VC as a consequence of crop destruction.

**About 20 percent of these subjects indicated that at least some people took refuge after the spray operations. Additionally, RAND has interviewed 100 refugees in Vietnam. Only about eight of these subjects were aware of crop destruction in their area, and none of them mentioned food shortage as a reason for taking refuge. Very little data exist

was that the promised aid to refugees was highly uncertain. About a third felt they would starve or nearly so if forced to depend on GVN largess.

PUBLIC EDUCATION AND PROPAGANDA

In this sample, there are eight instances where our subjects recalled having heard (either through actual observation or rumor) of any US/GVN warning about or explanation of herbicide operations. There are over fifty cases of no warning or explanation. Of the former, two instances involved a US/GVN attempt to explain the reasons for an operation after it had taken place, and in both the operations involved accidental spraying of GVN-controlled areas. In the remaining six cases, two warnings suggested that (loosely paraphrasing our subjects) 'something was going to happen and the civilians had better get out of the area.' Two advised that a defoliation operation was going to take place in order to deny hiding places to the VC (one of which subsequently caused extensive crop damage -- for which no explanation was given.) Only two said that crops would be destroyed, explained why this was necessary, told the people that the chemicals would not harm them, and advised them to take refuge in secure GVN areas where they would receive assistance.*

Aside from these few instances, there is no evidence in our data to suggest that the US/GVN have made observable efforts to warn people of impending operations or explain the nature and purpose of chemical crop spraying. Nor is there any indication that any efforts to counter Viet Cong propaganda against the US/GVN crop spraying have reached these people (by late 1966).

Perhaps the most significant (and, with our sample, consistent)

at this time to support any analysis of the relationship between taking refuge and the chemical destruction of crops. For a more thorough analysis of refugees in one province, see Ref. 3. This study looked for, but was unable to locate, any direct relationship between spraying operations and refugee flow, even in a province of relatively intense spraying operations.

*In both of these latter cases, large groups actually did take refuge.

civilian reaction which can be identified from our data is that crop spraying operations contribute substantially to a temper of mind consistently receptive to Viet Cong propaganda designed to strengthen their control over the affected population and to discredit the GVN and the United States.* For the individual Vietnamese, the almost total US/GVN failure to warn, to advise, to explain the purpose of crop spraying does not go unnoticed. In sharp contrast, Viet Cong propaganda often sounds like good sense and, in view of one's own personal experience, has the ring of truth.

One civilian prisoner who had been a Farmer's Association cell leader in Tay Ninh Province explains why he felt the spraying caused the people of his village, including himself, to support the Viet Cong more:

Well, you see, the Government didn't give us any help. On the contrary, it sprayed chemical poison to destroy our crops and so forth. After the spraying, the VC cadres came to us, encouraged us, aroused our hatred for the Government, and at the same time gave us assistance.

And an old civilian farmer from nearby Binh Duong adds this postscript:

We have listened to the cadres' advice and their advice is just.

*Briefly, the VC propaganda themes most commonly mentioned by our sources relating to crop destruction are as follows:

- (1) The chemicals are toxic, and can cause sickness and/or death.
- (2) The GVN is not interested in the people's welfare, but only wants to cause them harm: It is insensitive, malicious, and totally without redeeming social value.
- (3) The Viet Cong represent the legitimate rational, humane and sincere interests of the people in their social revolution against the GVN.
- (4) The US/GVN are losing on the military front, and therefore are striking out blindly to destroy the Vietnamese people in an incorrect and misguided belief that, by doing so, they can destroy the Viet Cong.
- (5) The GVN is a puppet of America, which has imperialistic ambitions in Vietnam. The Americans have no concern for the Vietnamese people, and would prefer that they all starve in order that America could populate the country with her own people.

A search of all relevant captured documents indicates that the Viet Cong have not developed a uniform, country-wide campaign with respect to herbicide operations. Rather, each situation is explained for its maximum benefit according to the particular local situation.

WHAT CAN BE DONE?

Leaving aside for the moment the question of the effectiveness of herbicide crop destruction operations in denying food to the Viet Cong, it would be relevant to consider what, if anything, might be done to counter some of the hostility of the civilian population.

The available data are limited with regard to how one might overcome alienation through government action. However, a first priority, according to our data, would be an effective public education program designed to explain thoroughly, carefully, and consistently the nature of the chemicals and the reason for their being sprayed. One of our subjects, a teacher from Phu Yen Province, was adamant on this point:

.... If the chemicals are sprayed on the people's crops, it is a good chance for the VC cadres to make the people's hatred for Americans more profound. Thus, I think the Government should explain clearly to the people the reasons and aims for the military operations which destroy the people's crops. Avoid using the term, "These are the VC's crops." This is not correct. They should say, "The peoples' crops have to be destroyed or the VC will use them to fight against the people." Don't keep the truth from the people as the Ministry of Information has often done. It is necessary to release proper information and to explain the events to the people scientifically and logically.

This man was not alone in his views, for at least seven others made comparable suggestions.

Public education alone may help reduce alienation, but it can achieve only limited success if not coupled to a program of active aid designed to convince the civilian population that the US/GVN conducts spraying operations to defeat the Viet Cong, that it has no malicious intentions toward the populace, that, on the contrary, it has a sincere concern for their welfare. The civilian population should not be allowed to starve as a result of intense herbicide operations. Unless and until some such understanding is reached, the probability is high that political alienation of the civilian population will continue to result from herbicide crop destruction.

In the final analysis, however, it becomes necessary to return to the question of the effectiveness of herbicide operations in denying food to the Viet Cong. If crop destruction has had a significant adverse

effect on the peasant attitudes toward the GVN, and if, in addition, it has not had, and does not hold much promise of having, any significant adverse direct effect on the Viet Cong's food supply, then it would seem that, on the basis of these limited criteria, such operations may have been dysfunctional. As presently conducted, it is not impossible that they may have been counterproductive to the long-range US/GVN pacification effort.

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